

Assess Your Impact

No Action is an Action!

Objectives

Students will (1) monitor their water use, (2) identify, develop, and practice responsible water conservation behavior, (3) identify non-point source pollution and the effects on water quality, humans and wildlife, (4) identify personal choices that will help conserve water and reduce non-point source pollution.

Curriculum Areas

Science, Social Studies and Language Arts

California Content Standards

Science

K Physical Science 1; Life Science 2; Earth Science 3

1st Life Science 2 a, c, e

2nd Life Science 2 c; Earth Science 3 e

3rd Life Science 3 a, c d

4th Life Science 2, 3 a, b

5th Earth Science 3 a, b, c, d, e

6th Earth Science 2 a, b; Ecology 5 b, e; Resources 6 b, c

7th Evolution 3e; Earth Science 4 a, c

8th Physical Science 3 b, c; Chemistry 6 a, b, c

Language Arts

K-2 *water use only*; 3-8 *both activities*

K-2 Listen/Speak 1.0

3rd Reading 1.0; Writing 1.0; Written/Oral 1.0; Listen/Speak 1.0

4th Reading 1.0, 2.0; Writing 1.0, 2.0; Written/Oral 1.0; Listen/Speak 1.0

5th Reading 1.0, 2.0; Writing 1.0, 2.0, Listen 1.0, 2.0

6th Reading 1.0; Writing 1.0, 2.0; Written/Oral 1.0; Listening 1.0, 2.5

7th Writing 1.0, 2.0; Written/Oral 1.0; Listening 1.0; Speaking 2.3, 2.4

8th Written/Oral 1.0; Speaking 2.3, 2.4

History/Social Studies

K K.4

1st 1.1, 1.2, 1.5

2nd 2.1, 2.2

3rd 3.1, 3.4, 3.5

4th 4.1, 4.4, 4.5

5th 5.7, 5.8

Method

Students will gather data to explore water use, sources of non point source pollution. Students will identify actions they can take to reduce non-point source pollution and conserve water.

Materials

- Water-Use Worksheet and *Wise Water-Use Tips*
- *Non-point Source Pollutants and Safe Substitutes to Reduce Non-point Source Pollution* Handouts
- Map of the local community

Background

Water use is such an automatic and habitual daily activity that we often do not understand the consequences of using water. Each time we draw water from its natural setting or modify the natural journey of water, we are likely to have an impact on salmon, other wildlife, and habitats. For example, dams block the salmon on their way back to their natal stream, and draining wetlands removes water from natural wildlife nurseries. Once water is diverted from its natural path and is used by humans, it is often contaminated or polluted. Contamination entering the water cycle can have damaging consequences for people, wildlife, and the environment.

Land-based pollution can either be from a “point source” or a “non-point source.” Point source pollution starts from a specific place such as an oil refinery. Non-point source pollution is contaminated runoff starting from an indefinite or undefined place, often a variety of places. The soot, dust, oil, animal wastes, litter, sand, salt, pesticides and other chemicals that constitute non-point source pollution often come from everyday activities such as fertilizing lawns, walking pets, changing motor oil, and driving. With each rainfall, pollutants from these activities are washed from lawns and streets into

storm drains that often lead directly to nearby bodies of water such as streams, rivers, and oceans.

Humans have water use choices. We can make decisions to use water respectfully and carefully while conserving water as a part of daily life. Water conservation reduces or prevents destruction of natural habitats by lessening the need for dams and other interventions. It also reduces the depletion of underground water stores that supply water for riparian and other habitats. Water conservation may also decrease wastewater discharges into sensitive environments such as estuaries.

In addition to conservation, we can be careful to prevent potential toxins like pesticides, detergent, fertilizers, motor oils, aerosols, cleaning fluids and powders, caustic acids, fuels and their byproducts from entering the water-cycle. We can affect both the quantity and quality of available water through personal and public conservation practices.

Procedure

Before class:

Copy student handouts:

- *Water-Use Worksheet* and *Wise Water Use Tips*
- *Non-point Source Pollutants* Handout
- *Safe Substitutes to Reduce Non-point Source Pollution* Handout

During class:

Part I Water Conservation

1. Introduce a brief class discussion of water and its use. All life depends on water to survive. Wherever we live, we do things each day that affect water, and influence the well-being of salmon, other wildlife, and people. Did the students know there is a fixed amount of water on Earth and its atmosphere? Of this only 0.003 percent is clean, fresh water that is usable.
 - Ironically, the Earth is covered with water (71%) yet, only a small percent is available for use by humans and wildlife. Discuss sources of water.
 - 97% of the water contains salt (oceans, seas or salt water lakes or rivers).
 - Water forms the ice caps and glaciers. A small amount of water is unavailable because it is too far underground, polluted, trapped in soil,

etc.

- Freshwater lakes, rivers and ground water provide the available water for human, salmon and other wildlife use.
2. Since our water is limited, is it important for humans to conserve water, use it wisely, and protect its quality?
 - Distribute the *Water-Use Worksheet* and ask students to keep track of how much water is used in their homes for seven days, from Saturday to Friday.
 - Students may post the worksheet on their refrigerator. Family member may help by putting a mark in the section designated after each water use.
 - The miscellaneous section is for special uses not listed (filling a fish tank, bathing the dog).
 - Students should bring their results on Monday.
 3. On Monday, make a master chart that summarizes the total household use for the class.
 - Brainstorm ways to conserve water.
 - Challenge each student to reduce use and invite families to join.
 - On Friday, hand out another *Water-Use Worksheet* and a copy of the *Wise Water-Use Tips*. Have students monitor use for another seven-day period (Saturday to Friday) while using the wise water use tips.
 - Have students bring in their results on Monday and tabulate. Compare week 1 with week 2. Was there a significant reduction in water use?
 4. Lead a discussion on what was easy to change and what was harder.

Part II Non-point Source Water Pollution

1. Remind students that wise conservation practices are only one part of water stewardship. Humans make choices about the amount of water they use and what they put down the drain. Keeping water free of pollutants is important for humans, plants, and wildlife. Ask students what they know about non-point source pollution. Have they heard the term? Do they know what it means? What are some examples? (Answer: Non-point source pollution is contaminated runoff originating from an indefinite or undefined place, or more often a variety of places).

2. Ask students what types of non-point source pollution might be originating from their school and their community. Write their answers on the board.
3. Pass out the *Non-point Source Pollutants and Safe Substitutes to Reduce Non-point Source Pollution* handouts. Go over the information as a group.
4. Ask students to think about possible sources of non-point source pollution in the community. Pass out copies of a community map. Ask students to locate possible sources of non-point source pollution and see where it may go. Does it empty into a waterway? Examples could include:

Schools

- Playgrounds, ball fields (trash, fertilizers, pesticides)
- Sewage system, including restrooms, cafeteria, and science classes (trash, excess nutrients, detergents, chemicals, pathogens)
- Parking lot (trash, heavy metals, dripping oil)
- Sidewalks and outdoor hallways (trash)

Community

- Farmland (sediments, excess nutrients, fertilizers, pesticides)
 - Construction sites (trash, sediments)
 - Residential areas (trash, fertilizers, pesticides, detergents from car washing)
 - Parking lots (trash, heavy metals, dripping oil)
 - Parks (trash, fertilizers, pesticides, animal waste)
5. Brainstorm about actions students and their parents or caregivers can take to reduce pollutants entering the watershed. Examples:
 - Put your trash in garbage cans (Storm drains carrying litter empty into local waterways).
 - Dispose of chemicals at approved household hazardous waste collection sites. Do not dump them on the ground or down storm drains.
 - Walk pets on grassy areas, and pick up after your pets to prevent pet waste from entering the storm water system.
 - Keep cars well maintained and free of leaks. Recycle used motor oil.
 - Compost yard waste, and don't dispose of leaves or grass clippings in your storm drain. Landscape your yard to prevent water runoff.
 - Never exceed manufacturers' recommendations for use of chemical

products.

- Use as few pesticides as possible. Use "natural" approaches to pest control and organic gardening techniques.
6. Consider ways for students to help reduce non-point source pollution at its source, beginning at home, extending to their school, and out in the community. Most of the activities would likely be done by adults; however, students would need to advocate these suggestions. Brainstorm with students how they can approach adults in a helpful manner. Possible activity suggestions:
 - Use maps and information from this activity to create a non-point source pollution display for the school and community.
 - Make a list of pollutants your school is generating (detergents, pesticides, fertilizers), discuss with school staff non-point source pollution, and suggest alternative products.
 - Conduct a storm drain stenciling activity around your school to alert people about the hazards of non-point source pollution. Contact your local public works department to find out about their stenciling program.
 - Write to local or state representatives to find out what measures are being taken (or considered) to reduce non-point source pollution.

Extension

1. Consider other stewardship actions such as:
 - Planting trees at home, at the school, or in your community.
 - Plant native trees, shrubs or grasses in a riparian area.
 - Participate in a river or beach clean-up day
2. Have a class discussion on the process of problem solving.
 - Define the problem
 - Brainstorm solutions
 - Analyze the suggestions
 - Evaluate and select the best solution
 - Apply the process to water conservation and water pollution problems and create an action

How Much Water Does Our Household

Use	Gallons per use	Number of times (tally)	Total Gallons
Flushing toilet	3 1.6 with Low Flow		
Brushing teeth	3 with water running 1 with water off		
Shower ____ minutes	5 gal/min with old shower head 2.5 gal/min with new shower head		
Taking a bath	40 if full		
Washing dishes	10		
Washing clothes	40		
Watering lawn	40		
Washing car	40 0 (carwash recycles water)		
Other:	estimate ____		
Other:	estimate ____		
Other:	estimate ____		

Wise Water Use Tips

Shower: Rinse yourself off, and then turn off water while you lather up. Turn it back on to rinse off. This will reduce the number of minutes the shower is on. A new shower head may be installed. New shower heads made in the U.S.A. will use a maximum of 2.5 gallons/minute.

Brushing teeth: Turn on the water to wet the brush then turn it off until brushing is complete and you are ready to rinse. This uses less than 1 gallon.

Washing Clothes: Wash only full loads; this will reduce the number of loads needed.

Washing Dishes: Only run the dishwasher with a full load; this reduces the number of loads.

Bathtub: Fill the bath only halfway, this saves 20 gallons.

Toilet: Toilets made after 1992 use an average of 1.6 gallons/flush. For older toilets place a plastic bottle filled with water in the tank. This reduces the amount of water used for each flush by the amount of water in the bottle.

Washing a car: Use a carwash that recycles water. This saves 40 gallons and reduces water pollution.

Watering your garden: Water once per week, deeply in the early morning (reduces evaporation). Use a bucket in the kitchen and bath for water when waiting for water to warm up. Use this water for plants. Encourage the planting of native and drought-tolerant plants, because they need less watering.

Cleaning house: Use a broom instead of a hose to clean the driveway or patio. Save water, get exercise!

Non-point Source Pollutants

Debris
(plastics, glass, metals,
woods)

Runoff from roads, landfills, and
parking lots into storm drains, sewer
systems, beach and boating activities

Can harm aquatic life by
entanglement or ingestion

Sediments

Construction sites, agricultural lands,
logging areas

Clouds water, decreases
plant productivity,
suffocates bottom-dwelling
organisms

Excess nutrients
(fertilizers, animal wastes,
sewage, yard waste)

Livestock, gardens, lawns, sewage
treatment systems, runoff from streets

Prompts phytoplankton
or algal blooms, causes
eutrophication (depleted
oxygen), and odor

Acids, salts, heavy metals

Runoff from roads, landfills, and
parking lots, roadway snow, dumping
sites

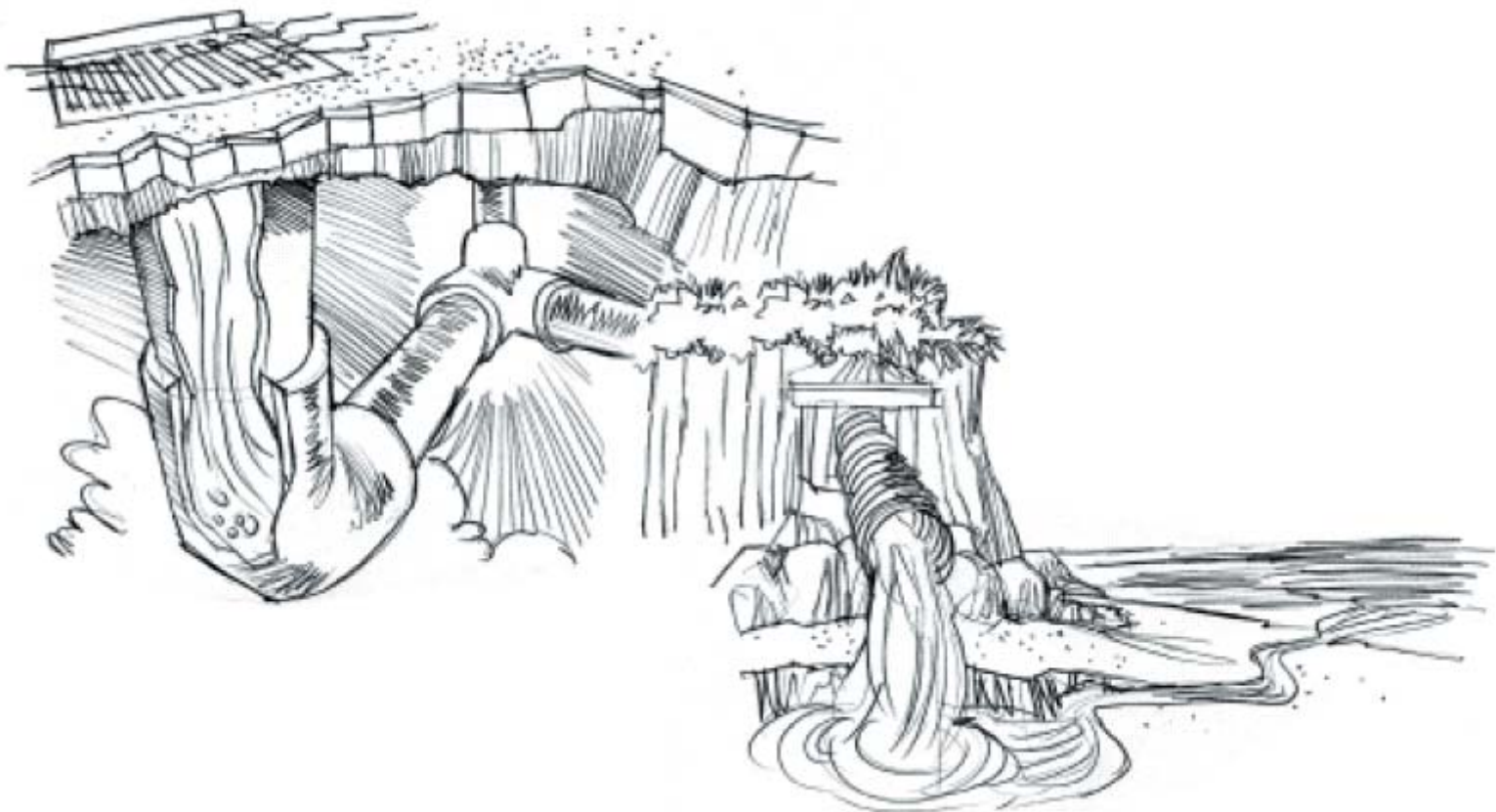
Toxic to aquatic life
and can be taken up
by organisms and
bioaccumulate in their
tissues

Organic chemicals
(pesticides, oil, detergents)

Forests and farmland, antifouling
boat paints, home lawns, golf
courses, sewage treatment systems,
street runoff

Chronic and toxic effects
on wildlife and humans,
possibly carcinogenic

Pathogens (coliform bacteria)



Safe Substitutes to Reduce Non-point Source Pollution

At Home

Air Fresheners

- For sink disposal odors, grind up used lemons.
- For surface odors on utensils and chopping blocks, add a few drops of white vinegar to soapy water.

Deodorizers

- For carpets, mix 1 part borax with 2 parts cornmeal; spread liberally and vacuum after an hour.
- Sprinkle baking soda in the bottom of cat boxes and garbage cans.

Dish Detergents

- Use mild, biodegradable, vegetable oil-based soap or detergent.
- For dishwashers, choose a detergent with the lowest phosphate content.

Disinfectants

- For disinfecting tasks, use ½ cup borax in 1 gallon hot water.

Drain openers

- Pour boiling water down the drain once a week.
- For clogs, add a handful of baking soda and ½ cup white vinegar to your drain, cover tightly and let sit 15 minutes while carbon dioxide bubbles work on clog. Finish with 2 quarts boiling water, and follow with a plunger.

Floor cleaners

- For plain wood floors, use a damp mop with mild vegetable oil soap and dry immediately.
- For painted or varnished wood floors, combine 1 teaspoon of washing soda with 1 gallon of hot water. Rinse and dry immediately.
- For vinyl floors, combine ¼ cup white vinegar and ¼ cup washing soda with 1 gallon of warm water, and mop.
- For scuff marks on linoleum, scrub with toothpaste.

Furniture polish

- For finished wood, clean with mild vegetable oil soap.
- For unvarnished wood, polish with almond, walnut, or olive oil; be sure to remove excess oil.
- Revitalize old furniture with linseed oil.

Glass cleaner

- Combine 1 quart water with ¼ cup white vinegar.

Laundry detergent

- Avoid products containing phosphates and fabric softeners.

Bathrooms

- Combine 1/2 cup borax in 1 gallon of water for cleaning and disinfecting toilets.
- Clean toilets frequently with baking soda.
- Tub and sink cleaners: Use baking soda or a nonchlorinating scouring powder.

For the Garden

Garden fertilizers

- Use organic materials such as compost, either from your own compost pile or purchased from the store.

Garden weed and fungus control

- Use less-toxic soap solutions for weed killers.
- For fungus, use less-toxic sulfur-based fungicides.
- To control powdery mildew on roses, spray both sides of rose leaves (in the morning, weekly) with a mixture of 2 tablespoons mild liquid soap, 2/3 teaspoon baking soda, and 1 gallon water.

Pest Control

- For outdoor ants, place boric acid in problem areas.
- For indoor ants and roaches, caulk entry points. Apply boric acid dust in cracks and insect walkways. Be sure it's inaccessible to children and pets (it's a mild poison to mammals).
- For garden aphids and mites, mix 1 tablespoon of liquid soap and 1 cup of vegetable oil. Add 1 teaspoon of mixture to a cup of water and spray. (Oil may harm vegetable plants in the cabbage family.)
- For caterpillars in the garden, apply products containing *Bacillus thuringiensis* to the leaves when caterpillars are eating.
- For mosquitoes in the yard, burn citronella candles.

Source: Take Me Shopping: A Consumers Guide to Safer Alternatives for Household Hazardous Products. Published by the Santa Clara County Hazardous Waste Management Program.

Watch out for these toxic ingredients!

Degreasers: trichloroethylene (TCE), toluene, methylene chloride. **Disinfectants:** phenylphenol, phenol chlorobenzene, diethylene glycol.

Drain cleaners: sodium hydroxide, potassium hydroxide, hydrochloric acid. **Dry cleaning**

fluids: TCE, perchloroethylene (PERC), 1,1,1-trichloroethane (TCA), naphtha. **Gasoline:**

benzene, paradichlorobenzene. **Oven cleaners:**

methylene chloride, xylene, toluene, methyl ethyl ketone chloride, nitrobenzene. **Spot removers or cleaning fluids:** carbon tetrachloride, 1,1,1-trichloroethane (TCA), trichloroethylene (TCE), perchloroethylene (tetrachloroethylene, PERC). **Toilet bowl deodorizers:** paradichlorobenzene. **Upholstery cleaners:** TCE. Wood preservatives: pentachlorophenols (PCPs), arsenic.